Apprenticeship and Industry Training

Motorcycle Mechanic

Apprenticeship Course Outline

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Alberta

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Motorcycle Mechanic
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Apprenticeship

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding an employer. Employers hire apprentices, pay their wages and provide on-the-job training and work experience. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journeyperson or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution – usually a college or technical institute.

To become certified journeypersons, apprentices must learn theory and skills, and they must pass examinations. Requirements for certification—including the content and delivery of technical training—are developed and updated by the Alberta Apprenticeship and Industry Training Board on the recommendation of Motorcycle Mechanic Provincial Apprenticeship Committee.

The graduate of the Motorcycle Mechanic apprenticeship program is a certified journeyperson who will be able to:

- repair and maintain motorcycles and ATVs which are powered with internal combustion engines
- comprehend work orders, technical bulletins and estimates, and relate the information to the job at hand
- interpret warranty policy in terms of service reports, component failures and analysis records
- when his/her Journeyperson Certificate has been earned, the Motorcycle Mechanic may opt to specialize in the repairing, rebuilding and servicing of any one or more of the many assemblies of the modern motorcycle
- have executive and supervisory opportunities in the motorcycle industry which are frequently available to trained and certified mechanics with above capabilities and motivation
- be able to familiarise him/her with the work experience of closely allied equipment: e.g. snowmobiles, outdoor power equipment
- perform assigned tasks in accordance with quality and production standards required by industry

Apprenticeship and Industry Training System

Industry-Driven

Alberta's apprenticeship and industry training system is an industry-driven system that ensures a highly skilled, internationally competitive workforce in more than 50 designated trades and occupations. This workforce supports the economic progress of Alberta and its competitive role in the global market. Industry (employers and employees) establishes training and certification standards and provides direction to the system through an industry committee network and the Alberta Apprenticeship and Industry Training Board. The Alberta government provides the legislative framework and administrative support for the apprenticeship and industry training system.

Alberta Apprenticeship and Industry Training Board

The Alberta Apprenticeship and Industry Training Board provides a leadership role in developing Alberta's highly skilled and trained workforce. The board's primary responsibility is to establish the standards and requirements for training and certification in programs under the Apprenticeship and Industry Training Act. The board also provides advice to the Minister of Advanced Education on the needs of Alberta's labour market for skilled and trained workers, and the designation of trades and occupations.

The thirteen-member board consists of a chair, eight members representing trades and four members representing other industries. There are equal numbers of employer and employee representatives.

Industry Committee Network

Alberta's apprenticeship and industry training system relies on a network of industry committees, including local and provincial apprenticeship committees in the designated trades, and occupational committees in the designated occupations. The network also includes other committees such as provisional committees that are established before the designation of a new trade or occupation comes into effect. All trade committees are composed of equal numbers of employer and employee representatives. The industry committee network is the foundation of Alberta's apprenticeship and industry training system.

Local Apprenticeship Committees (LAC)

Wherever there is activity in a trade, the board can set up a local apprenticeship committee. The board appoints equal numbers of employee and employer representatives for terms of up to three years. The committee appoints a member as presiding officer. Local apprenticeship committees:

- monitor apprenticeship programs and the progress of apprentices in their trade, at the local level
- make recommendations to their trade's provincial apprenticeship committee (PAC) about apprenticeship and certification in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- make recommendations to the board about the appointment of members to their trade's PAC
- help settle certain kinds of disagreements between apprentices and their employers
- carry out functions assigned by their trade's PAC or the board

Provincial Apprenticeship Committees (PAC)

The board establishes a provincial apprenticeship committee for each trade. It appoints an equal number of employer and employee representatives, and, on the PAC's recommendation, a presiding officer - each for a maximum of two terms of up to three years. Most PACs have nine members but can have as many as twenty-one. Provincial apprenticeship committees:

- Make recommendations to the board about:
    - standards and requirements for training and certification in their trade
    - courses and examinations in their trade
    - apprenticeship and certification
    - designation of trades and occupations
    - regulations and orders under the Apprenticeship and Industry Training Act
- monitor the activities of local apprenticeship committees in their trade
- determine whether training of various kinds is equivalent to training provided in an apprenticeship program in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- consult with other committees under the Apprenticeship and Industry Training Act about apprenticeship programs, training and certification and facilitate cooperation between different trades and occupations
- consult with organizations, associations and people who have an interest in their trade and with employers and employees in their trade
- may participate in resolving certain disagreements between employers and employees
- carry out functions assigned by the board

Motorcycle Mechanic PAC Members at the Time of Publication

Mr. C. Zilkie	Edmonton	Presiding Officer
Mr. D. Fletcher	Raymond	Employer
Mr. G. Knodel	Medicine Hat	Employer
Mr. P. Gibson	Red Deer	Employee
Mr. M. Dunford	Grande Prairie	Employee
Mr. B. Mayne	Camrose	Employee
Mr. J. Taylor	Tofield	Employee

Alberta Government

Alberta Advanced Education works with industry, employer and employee organizations and technical training providers to:

- facilitate industry's development and maintenance of training and certification standards
- provide registration and counselling services to apprentices and employers
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

Technical Institutes and Colleges

The technical institutes and colleges are key participants in Alberta's apprenticeship and industry training system. They work with the board, industry committees and Alberta Advanced Education to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship programs. They develop lesson plans from the course outlines established by industry and provide technical training to apprentices.

Apprenticeship Safety

Safe working procedures and conditions, incident/injury prevention, and the preservation of health are of primary importance in apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of government, employers, employees, apprentices and the public. Therefore, it is imperative that all parties are aware of circumstances that may lead to injury or harm.

Safe learning experiences and healthy environments can be created by controlling the variables and behaviours that may contribute to or cause an incident or injury. By practicing a safe and healthy attitude, everyone can enjoy the benefit of an incident and injury free environment.

Alberta Apprenticeship and Industry Training Board Safety Policy

The Alberta Apprenticeship and Industry Training Board (board) fully supports safe learning and working environments and emphasizes the importance of safety awareness and education throughout apprenticeship training- in both on-the- job training and technical training. The board also recognizes that safety awareness and education begins on the first day of on-the-job training and thereby is the initial and ongoing responsibility of the employer and the apprentice as required under workplace health and safety training. However the board encourages that safe workplace behaviour is modeled not only during on-the-job training but also during all aspects of technical training, in particular, shop or lab instruction. Therefore the board recognizes that safety awareness and training in apprenticeship technical training reinforces, but does not replace, employer safety training that is required under workplace health and safety legislation.

The board has established a policy with respect to safety awareness and training:

> **The board promotes and supports safe workplaces, which embody a culture of safety for all apprentices, employers and employees. Employer required safety training is the responsibility of the employer and the apprentice, as required under legislation other than the *Apprenticeship and Industry Training Act*.**

The board's complete document on its 'Apprenticeship Safety Training Policy' is available at www.tradesecrets.alberta.ca; access the website and conduct a search for 'safety training policy'.

Implementation of the policy includes three common safety learning outcomes and objectives for all trade course outlines. These common learning outcomes ensure that each course outline utilizes common language consistent with workplace health and safety terminology. Under the title of 'Standard Workplace Safety', this first section of each trade course outline enables the delivery of generic safety training; technical training providers will provide trade specific examples related to the content delivery of course outline safety training.

Workplace Health and Safety

A tradesperson is often exposed to more hazards than any other person in the work force and therefore should be familiar with and apply the Occupational Health and Safety Act, Regulations and Code when dealing with personal safety and the special safety rules that apply to all daily tasks.

Workplace Health and Safety (Alberta Employment and Immigration) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at www.worksafely.org

Technical Training

Apprenticeship technical training is delivered by the technical institutes and many colleges in the public post-secondary system throughout Alberta. The colleges and institutes are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All training providers place great emphasis on safe technical practices that complement safe workplace practices and help to develop a skilled, safe workforce.

The following institutions deliver Motorcycle Mechanic apprenticeship technical training:

Grande Prairie Regional College

Procedures for Recommending Revisions to the Course Outline

Advanced Education has prepared this course outline in partnership with the Motorcycle Mechanic Provincial Apprenticeship Committee.

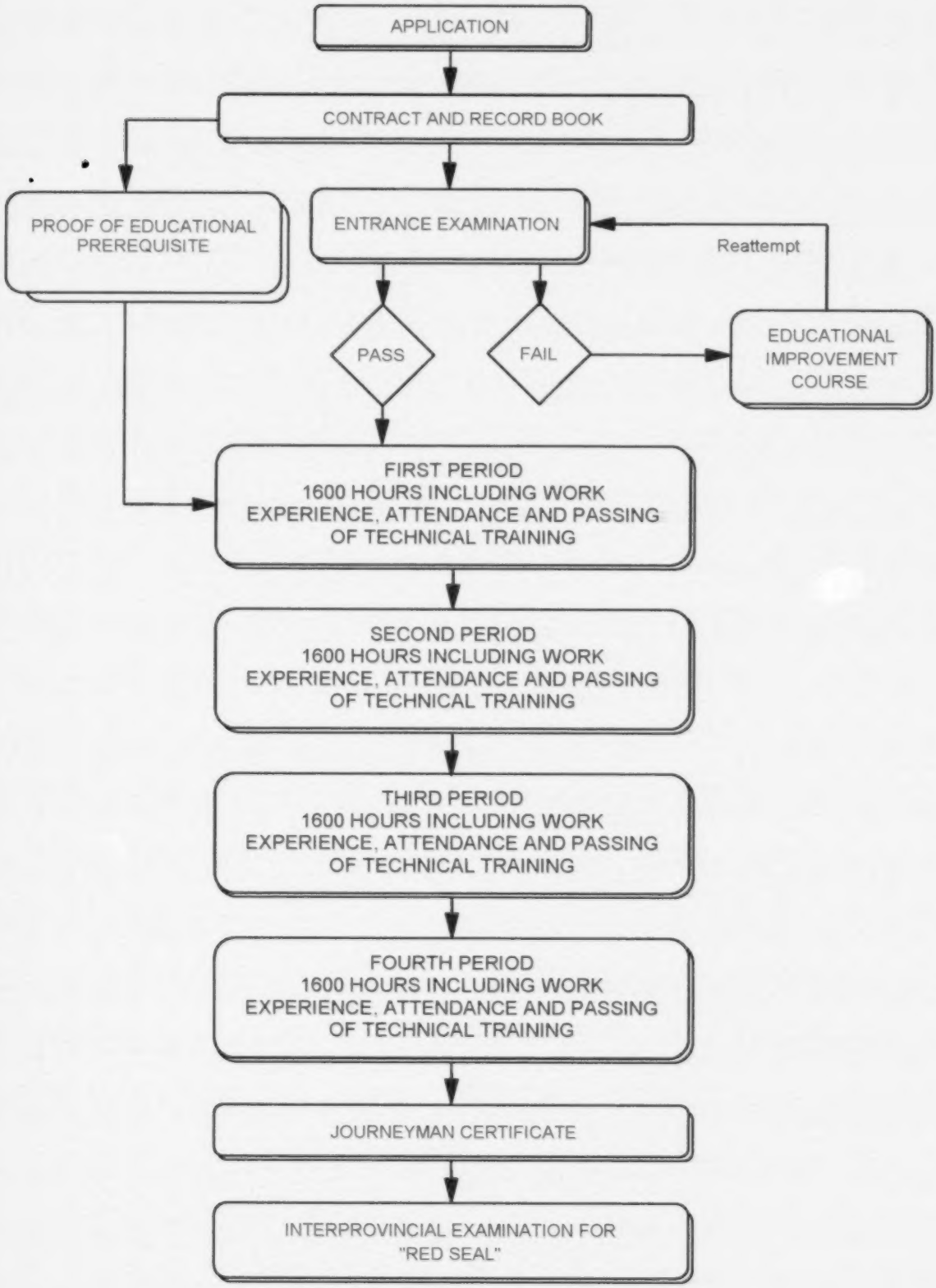
This course outline was approved on December 9, 2011 by the Alberta Apprenticeship and Industry Training Board on a recommendation from the Provincial Apprenticeship Committee. The valuable input provided by representatives of industry and the institutions that provide the technical training is acknowledged.

Any concerned individual or group in the province of Alberta may make recommendations for change by writing to:

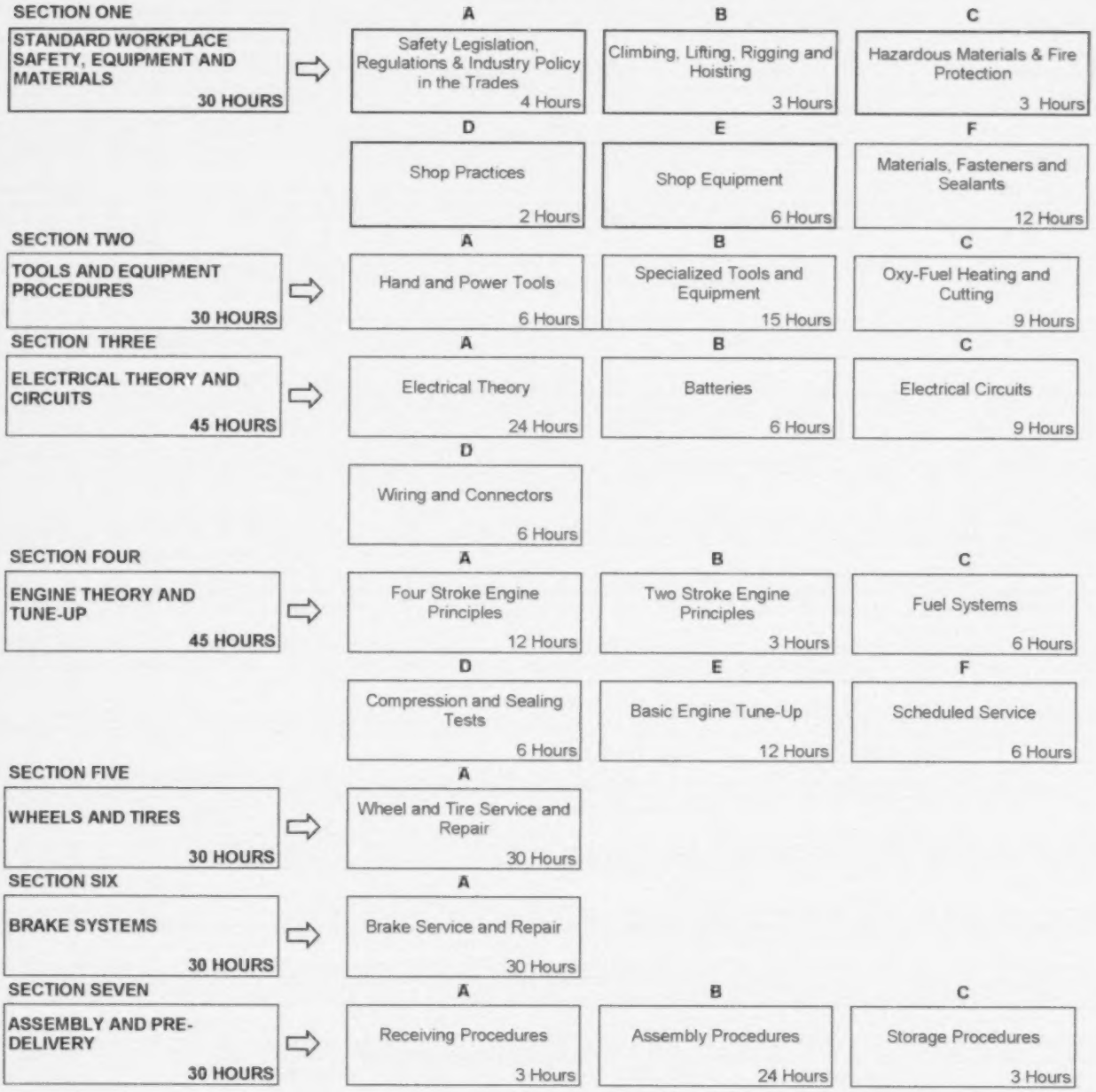
Motorcycle Mechanic Provincial Apprenticeship Committee
c/o Industry Programs and Standards
Apprenticeship and Industry Training
Advanced Education
10th floor, Commerce Place
10155 102 Street NW
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used. Recommendations for change will be placed on the agenda for regular meetings of the Motorcycle Mechanic Provincial Apprenticeship Committee.

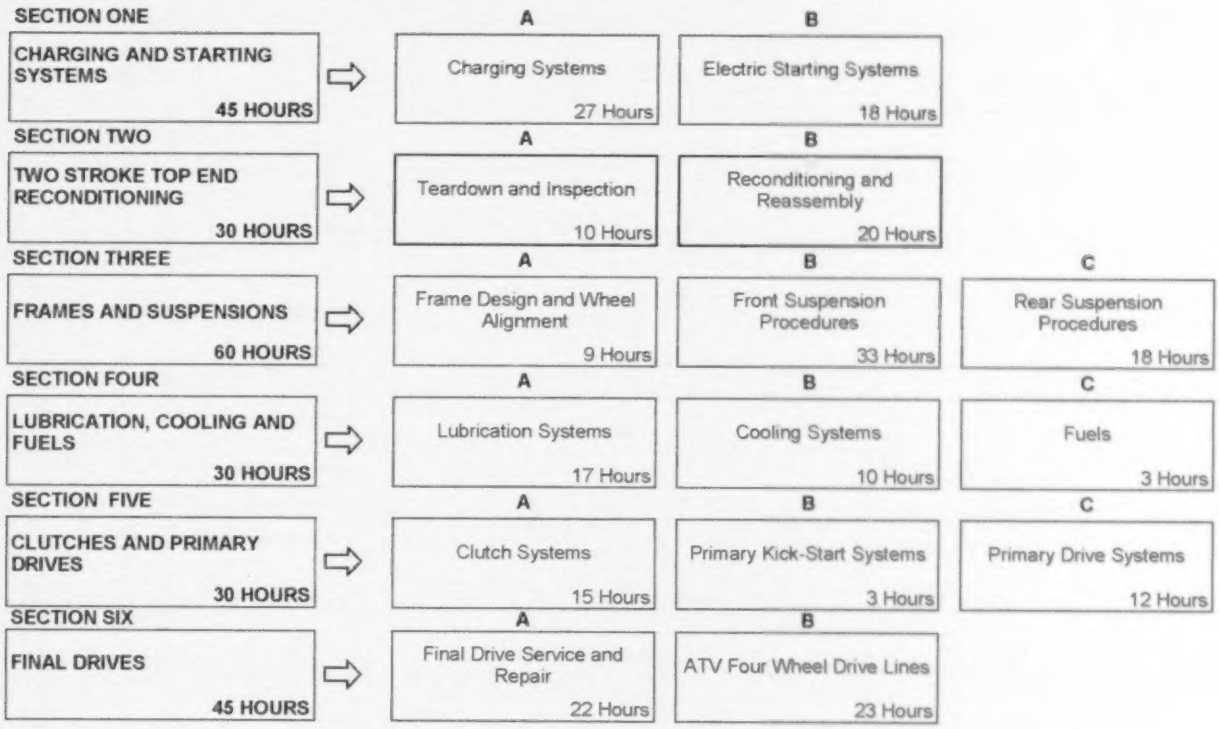
Apprenticeship Route toward Certification


APPLICATION
CONTRACT AND RECORD BOOK
PROOF OF EDUCATIONAL PREREQUISITE
ENTRANCE EXAMINATION
Reattempt
PASS
FAIL
EDUCATIONAL IMPROVEMENT COURSE
FIRST PERIOD
1600 HOURS INCLUDING WORK EXPERIENCE, ATTENDANCE AND PASSING OF TECHNICAL TRAINING
SECOND PERIOD
1600 HOURS INCLUDING WORK EXPERIENCE, ATTENDANCE AND PASSING OF TECHNICAL TRAINING
THIRD PERIOD
1600 HOURS INCLUDING WORK EXPERIENCE, ATTENDANCE AND PASSING OF TECHNICAL TRAINING
FOURTH PERIOD
1600 HOURS INCLUDING WORK EXPERIENCE, ATTENDANCE AND PASSING OF TECHNICAL TRAINING
JOURNEYMAN CERTIFICATE
INTERPROVINCIAL EXAMINATION FOR "RED SEAL"

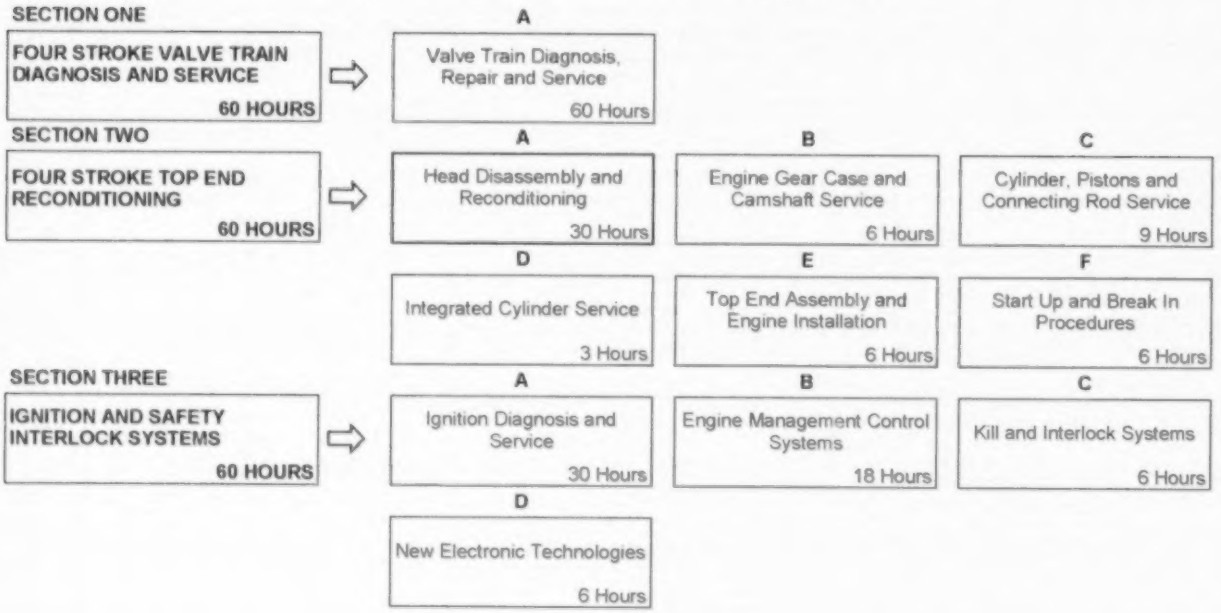
Motorcycle Mechanic Training Profile
FIRST PERIOD
(8 Weeks 30 Hours per Week – Total of 240 Hours)



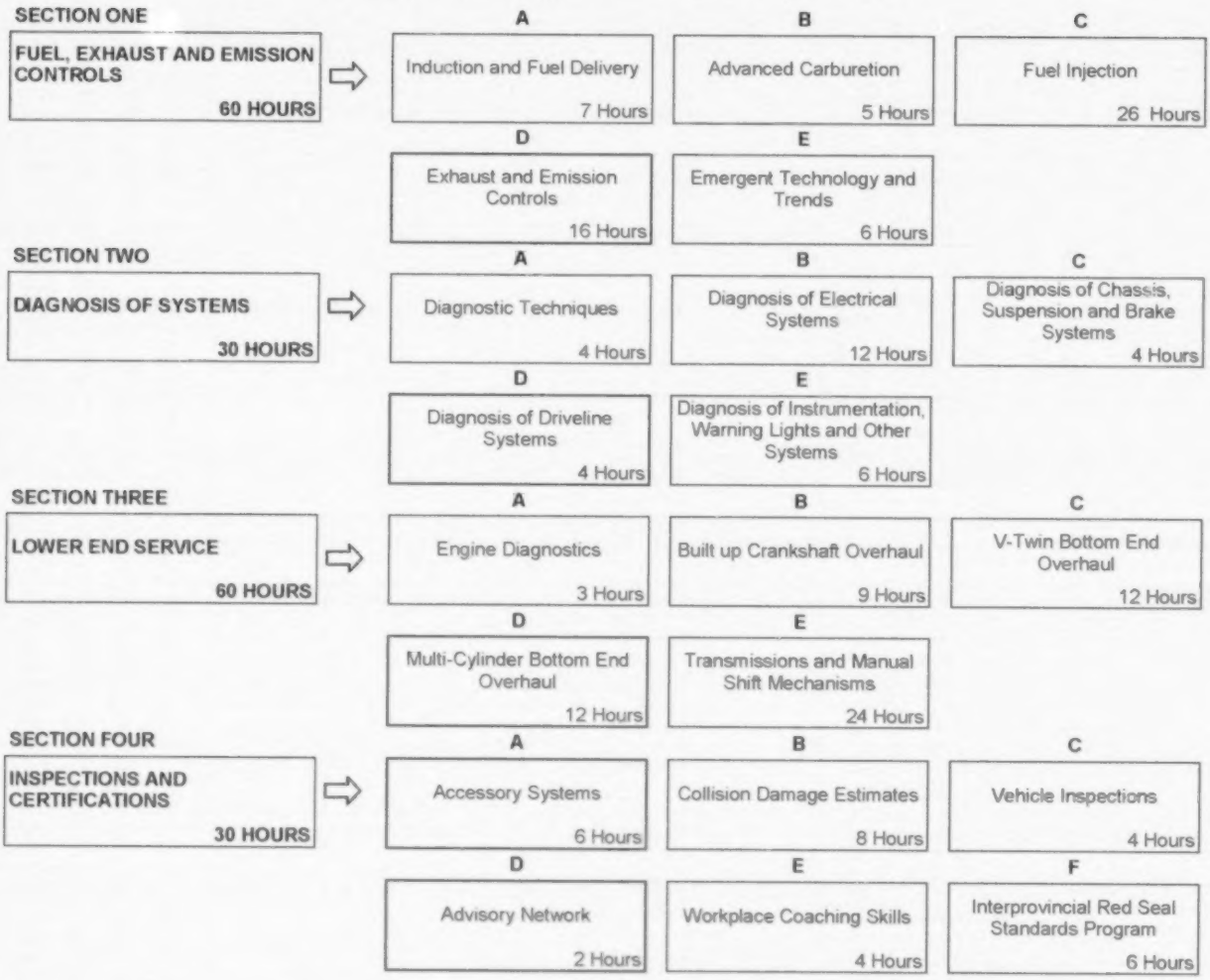
SECOND PERIOD
(8 Weeks 30 Hours per Week – Total of 240 Hours)



THIRD PERIOD
(6 Weeks 30 Hours per Week – Total of 180 Hours)



FOURTH PERIOD
(6 Weeks 30 Hours per Week – Total of 180 Hours)



NOTE: The hours stated are for guidance and should be adhered to as closely as possible. However, adjustments must be made for rate of apprentice learning, statutory holidays, registration and examinations for the training establishment and Apprenticeship and Industry Training.

FIRST PERIOD TECHNICAL TRAINING
MOTORCYCLE MECHANIC TRADE
COURSE OUTLINE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE:.....STANDARD WORKPLACE SAFETY, EQUIPMENT AND MATERIALS ..... 30 HOURS

A. Safety Legislation, Regulations & Industry Policy in the Trades ..... 4 Hours

Outcome: ***Describe legislation, regulations and practices intended to ensure a safe work place in the trade.***

1. Demonstrate the ability to apply the Occupational Health and Safety Act, Regulation and Code.
2. Explain the role of the employer and employee in regard to Occupational Health and Safety (OH&S) regulations, Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Workers Compensation Board regulations, and related advisory bodies and agencies.
3. Explain industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of workers and employers to apply emergency procedures.
5. Describe positive tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of employers and employees with respect to the selection and use of personal protective equipment (PPE).
7. Select, use and maintain appropriate PPE for worksite applications.

B. Climbing, Lifting, Rigging and Hoisting ..... 3 Hours

Outcome: ***Describe the use of personal protective equipment (PPE) and safe practices for climbing, lifting, rigging and hoisting in this trade.***

1. Select, use and maintain specialized PPE for climbing, lifting and load moving equipment.
2. Describe manual lifting procedures using correct body mechanics.
3. Describe rigging hardware and the safety factor associated with each item.
4. Select the correct equipment for rigging typical loads.
5. Describe hoisting and load moving procedures.

C. Hazardous Materials & Fire Protection ..... 3 Hours

Outcome: ***Describe the safety practices for hazardous materials and fire protection in this trade.***

1. Describe the roles, responsibilities features and practices related to the workplace hazardous materials information systems (WHMIS) program.
2. Describe the three key elements of WHMIS.
3. Describe handling, storing and transporting procedures when dealing with hazardous material.
4. Describe safe venting procedures when working with hazardous materials.
5. Describe fire hazards, classes, procedures and equipment related to fire protection.

D. Shop Practices ..... 2 Hours

Outcome: Work effectively in motorcycle service.

1. Use shop information systems to interpret a work order and create parts requisition.
2. Describe the legal responsibilities involved in motorcycle service.

E. Shop Equipment ..... 6 Hours

Outcome: Use common motorcycle shop equipment effectively.

1. Identify common shop equipment.
2. Use common shop equipment.
3. Maintain common shop equipment.

F. Materials, Fasteners and Sealants ..... 12 Hours

Outcome: Perform a thread repair procedures on a variety of materials.

1. Identify metallic and non-metallic materials and applications.
2. Describe threaded fastener types, measurements, applications and torque procedures.
3. Perform a thread cleaning, repairing, cutting, and broken fastener removal procedures.
4. Describe drill bits and operation of a drill press.
5. Describe the use of thread locking compounds, sealants, adhesives, surface prep-sprays and liquid gaskets.

SECTION TWO: ..... TOOLS AND EQUIPMENT PROCEDURES ..... 30 HOURS

A. Hand and Power Tools ..... 6 Hours

Outcome: Demonstrate the use of common hand tools.

1. Describe the types, uses and care of hand tools.
2. Demonstrate the use and maintenance of power hand tools.

B. Specialized Tools and Equipment ..... 15 Hours

Outcome: Use specialized equipment for cleaning, measuring, testing and service work.

1. Describe the uses and care of electrical testing and service tools.
2. Measure components to calculate wear and clearances.
3. Perform torque measurements and procedures.
4. Describe the use of specialized cleaning tools.
5. Describe the use of special service tools.
6. Describe the use of tune-up tools.
7. Describe wheel, suspension and frame tools and equipment.
8. Describe the purpose and use of engine service and overhaul equipment.

C. Oxyfuel Heating and Cutting ..... 9 Hours

Outcome: Perform the metal cutting and heating operations.

1. Describe the components, characteristics and safety requirements for oxyfuel torch use.
2. Describe oxyfuel torch use, set up, shut down and storage procedures.
3. Perform oxyfuel heating and cutting operations.

SECTION THREE: ..... ELECTRICAL THEORY AND CIRCUITS..... 45 HOURS

A. Electrical Theory ..... 24 Hours

Outcome: Perform meter tests to diagnose and repair electrical problems.

1. Describe electrical nomenclature.
2. Perform ohm's and watts law calculations.
3. Identify simple series and parallel circuits.
4. Identify shorts, opens and grounds.
5. Calculate voltage, current and resistance in series and parallel circuits.
6. Describe the power formula (watts) as applied to a lighting circuit.
7. Use a digital voltmeter, ammeter, ohmmeter and diode checker.
8. Perform a voltage drop tests in multiple circuits.
9. Perform a total amperage draw test in a lighting circuit.

B. Batteries ..... 6 Hours

Outcome: Perform battery maintenance and testing.

1. Describe battery construction, operation, activation, disposal and safety procedures.
2. Perform battery testing, servicing and storage procedures.
3. Describe new battery technology and electric propulsion systems for motorcycles.

C. Electrical Circuits ..... 9 Hours

Outcome: Use wiring diagrams to identify electrical problems.

1. Read a wiring schematic diagram.
2. Describe the use of test meters to identify circuit defects.
3. Test continuity in a simple lighting circuit.
4. Trace current flow on multiple circuit diagrams.

D. Wiring and Connectors ..... 6 Hours

Outcome: Repair electrical wires and connectors.

1. Describe multiple plug and crimp connector types, use and replacement.
2. Select wires, fuses or circuit breakers for an application.
3. Perform soldering and repair of connectors and wiring.

SECTION FOUR: ..... ENGINE THEORY AND TUNE-UP ..... 45 HOURS

A. Four Stroke Principles ..... 12 Hours

Outcome: Apply operating and design principles of four stroke engine operation.

1. Describe four stroke engine design, materials, components and operating principles.
2. Describe camshaft timing methods.

B. Two Stroke Principles ..... 3 Hours

Outcome: Apply operating and design principles to two stroke engine operation.

1. Describe two stroke engine design, materials and components.
2. Describe two stroke engine operating principles.

C. Fuel Systems ..... 6 Hours

Outcome: Service motorcycle fuel systems, air filters and air box.

1. Describe the individual fuel systems and types of air filters and carburetors.
2. Describe the fuel related principles of air pressure, air speed and atomization.
3. Describe the design differences and operation of carburetors.
4. Describe the effects of improper fuel storage on carburetor operation.
5. Perform inspection and service of air filters air box, ducting, hoses and clamps.
6. Overhaul a single venturi carburetor.

D. Compression and Sealing Tests ..... 6 Hours

Outcome: Perform compression, leak-down, and crankcase sealing tests.

1. Perform dry and wet compression tests.
2. Perform cylinder leak-down testing.
3. Perform two stroke crankcase pressure and vacuum tests.

E. Basic Engine Tune-Up ..... 12 Hours

Outcome: Perform an engine tune-up.

1. Perform basic ignition tune-up.
2. Perform valve clearance adjustment on a variety of adjustment designs:
3. Inspect the camshaft timing and adjust cam chain tension.
4. Perform adjustments and synchronization to multi-bank carburetors.
5. Perform engine start up and check procedures.

F. Scheduled Service ..... 6 Hours

Outcome: Perform manufacturer's scheduled maintenance.

1. Identify intervals and procedures for scheduled maintenance.
2. Perform procedures for scheduled maintenance.

3. Perform basic electrical tests and recognize if a fault code is set.
4. Describe the test ride procedures, safety, ethics and evaluation.

SECTION FIVE: .....WHEEL AND TIRES..... 30 HOURS

A. Wheels and Tires Service and Repair.....30 Hours

Outcome: Perform wheel and tire maintenance.

1. Identify the types of wheels used for modern motorcycles.
2. Describe tire applications, sizes, designs, policies, disclaimers and compatibility.
3. Perform a visual inspection and measurement of wheels.
4. Demonstrate wheel bearing replacement.
5. Perform wire spoke tension adjustment to correct wheel rim run-out.
6. Replace wire spoke rim and true to specifications.
7. Describe procedures required with bead lock devices.
8. Describe the criteria for determining repair or replacement for tires and rims.
9. Perform a flat tire repair on tube type tires.
10. Perform tire removal, mounting and balancing.
11. Remove and replace wheel assemblies.

SECTION SIX:.....BRAKE SYSTEMS ..... 30 HOURS

A. Brake Service and Repair .....30 Hours

Outcome: Repair and maintain brake systems.

1. Identify the components and operation of brake systems.
2. Describe brake fluids characteristics and classification.
3. Describe Pascal's law as it applies to hydraulic brakes.
4. Describe hydraulic and mechanical pressures in a multi-piston caliper system.
5. Perform brake hose replacement and bleeding.
6. Perform inspection, service and repair of drum and disc brake systems.
7. Rebuild master cylinders, wheel cylinders and callipers.

SECTION SEVEN: .....ASSEMBLY AND PRE-DELIVERY ..... 30 HOURS

A. Receiving Procedures .....3 Hours

Outcome: Handle crated motorcycles.

1. Describe lifting devices and procedures for handling crated units.
2. Describe inspection of incoming shipments for receiving.
3. Demonstrate procedures to report missing, damaged or duplicate parts.

B. Assembly Procedures ..... 24 Hours

Outcome: ***Perform assembly, pre-delivery inspections and related tasks.***

1. Identify manufacturer's policies relating to PDI.
2. Describe assembling a new motorcycle.
3. Describe the care and cleaning of chrome, anodized and polished metal surfaces.
4. Perform minor clear coat paint damage repair.
5. Perform minor abrasion repair to plastic windshields.
6. Perform a pre-delivery inspection.

C. Storage Procedures ..... 3 Hours

Outcome: ***Prepare motorcycles for storage.***

1. Prepare units for extended period of heated or unheated storage.

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MOTORCYCLE MECHANIC TRADE
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SECTION ONE: ..... CHARGING AND STARTING SYSTEMS ..... 45 HOURS

A. Charging Systems ..... 27 Hours

Outcome: Repair alternator charging systems.

1. Describe AC generator and lighting systems design, characteristics and operation.
2. Identify the location of charging and lighting system components.
3. Trace charging circuits using manufacturer's wiring diagrams.
4. Test vehicle charging systems for problem diagnosis and performance analysis.
5. Perform bench tests and inspections for diagnosis and performance analysis.
6. Describe alternator component removal inspection, repair and installation.
7. Describe the theory of operation of the flywheel magneto AC lighting system.
8. Demonstrate flywheel removal, inspection and installation.
9. Perform AC lighting system testing.
10. Describe installation procedures for lighting coils.

B. Electric Starting Systems ..... 18 Hours

Outcome: Repair electric starter systems.

1. Describe the components, operation and testing of electric start systems.
2. Identify the starter system design using wiring diagrams.
3. Perform starter motor removal and installation.
4. Remove and replace free running clutch.
5. Perform disassembly, inspection and reassembly of starter motors.
6. Test starter motor safety interlock systems.

SECTION TWO: ..... TWO STROKE TOP END RECONDITIONING ..... 30 HOURS

A. Teardown and Inspection ..... 10 Hours

Outcome: Prepare a two stroke engine for repair.

1. Prepare the unit for top end reconditioning.
2. Describe the test equipment used for engine diagnosis.
3. Perform tests, measurements and procedures to diagnose serviceability and problems.
4. Disassemble and inspect for defects, damage, deposits and other problems.
5. Visually inspect the crankshaft and connecting rod for problems.
6. Describe the removal, inspection and measurement of a cylinder reed valve assembly.

B. Reconditioning and Reassembly ..... 20 Hours

Outcome: Recondition two stroke engine top ends.

1. Describe cylinder base gasket construction, materials and removal methods.
2. Describe the testing, servicing and adjustments of exhaust power valve assemblies.
3. Recondition cylinder surfaces.
4. Assemble top end parts and related components.
5. Perform an initial start up and testing procedures for rebuilt two strokes.
6. Describe the break-in procedures used during tests on-road test or with a dynamometer.

SECTION THREE: .....FRAMES AND SUSPENSIONS ..... 60 HOURS

A. Frame Design and Wheel Alignment ..... 9 Hours

Outcome: Perform chassis inspection and alignment.

1. Describe types, materials and design features of motorcycle frames.
2. Describe steering damper systems and their function.
3. Describe wheel and chassis alignment effects on vehicle handling and tire wear.
4. Describe ATV steering mechanical and electronic systems.
5. Perform wheel and chassis alignment tests.
6. Describe rear suspension lift and lowering kits effects on ground clearance and handling.

B. Front Suspension Procedures ..... 33 Hours

Outcome: Perform inspections, service and overhaul of the front suspension systems.

1. Describe the designs, components and operation of front suspension systems.
2. Inspect a front suspension for leaks, wear, damage and misalignment.
3. Perform a front suspension fluid change.
4. Adjust front suspension air pressure.
5. Perform a fork seal replacement.
6. Perform overhaul and spring adjustments of front forks.
7. Perform a steering head bearing inspection and adjustment.
8. Perform alignment of front suspension components.
9. Describe routing of control cables and handlebar wiring.

C. Rear Suspension Procedures ..... 18 Hours

Outcome: Perform inspection, service and overhaul of the rear suspension system.

1. Describe the design, operation and adjustments of rear suspensions.
2. Inspect rear suspension components for leaks, wear, damage and misalignments.
3. Adjust suspension pressures using an on-board air compressor.
4. Service single shock units and linkages.
5. Service swing arm bushings or bearings.
6. Adjust dual shock systems.

7. Demonstrate ATV shock servicing and replacement.
8. Perform a suspension balance inspections and adjustments.

SECTION FOUR: .....LUBRICATION, COOLING AND FUELS..... 30 HOURS

A. Lubrication Systems .....17 Hours

Outcome: Perform service and repair of lubrication systems.

1. Describe motorcycle oil ratings and additive functions.
2. Identify manufacturer's lubrication requirements and service intervals
3. Describe engine lubrication systems design, components, operation and requirements.
4. Describe oil pumps design, operation, and testing.
5. Perform a lubrication filtration systems service.
6. Perform an inspection and overhaul on common oil pump types.
7. Describe 2-stroke engine lubrication systems, ratios and mixing methods.

B. Cooling Systems.....10 Hours

Outcome: Perform service and repair of cooling systems.

1. Describe the physical principles involved in heat transfer.
2. Describe the coolant properties, additives, mixing and disposal.
3. Describe motorcycle cooling system components, operation and problems.
4. Perform the testing, replacement and bleeding of coolant.
5. Perform cooling system tests and scheduled services.
6. Repair radiator cooling fins.
7. Describe auxiliary oil cooling system services.

C. Fuels.....3 Hours

Outcome: Select fuel for a specific application.

1. Describe the composition, characteristics, ratings, additives and applications of fuels.

SECTION FIVE: .....CLUTCHES AND PRIMARY DRIVES ..... 30 HOURS

A. Clutch Systems.....15 Hours

Outcome: Perform inspection, service and overhaul of clutch systems.

1. Describe the function, components and operation of clutch systems.
2. Overhaul clutches and release mechanisms.

B. Primary Kick-Start Systems.....3 Hours

Outcome: Perform the service and repair of primary type kick-start systems.

1. Describe the design, classification and operation of common kick-start systems.
2. Perform an external inspection and diagnosis of kick-starter systems.

C. Primary Drive Systems ..... 12 Hours

Outcome: Inspect service and repair primary drive systems.

1. Describe the design, components, operation and diagnostics of primary drives.
2. Perform inspection and adjustment of an external primary drives
3. Describe the operation and service of primary drive shock absorbers and constant velocity transmissions.
4. Perform diagnostic tests of an internal gear driven primary drive system.

SECTION SIX: ..... FINAL DRIVES ..... 45 HOURS

A. Final Drive Service and Repair ..... 22 Hours

Outcome: Perform the inspection, service and repair final drive systems.

1. Describe the design, operation, inspection, service and repair of chain drives.
2. Perform roller chain cleaning, lubrication and adjustment.
3. Describe the design, characteristics and cleaning of belt drives.
4. Perform Inspection, adjustment, service and repair of belt drives.
5. Describe the design, operation, characteristics and lubrication of shaft drives.
6. Perform inspections, diagnosis, measurements and repairs on shaft drives.

B. ATV Four Wheel Drivelines ..... 23 Hours

Outcome: Perform the diagnosis, service and repair of ATV drive lines.

1. Describe the design, operation and features of four wheel drive systems and components.
2. Inspect and service ATV front differentials and four wheel drive components.
3. Describe the design and operation of final drive shock damping systems.
4. Inspect the chain type final drive rear wheel cush drive couplings.
5. Inspect propeller shaft cam type damper mechanisms.
6. Identify the parts and components in a secondary bevel gear drive system.
7. Describe the inspections and measurements required to overhaul the secondary bevel gear system.
8. Identify similarities between secondary bevel gear drives and final drive gear case components.
9. Describe the operation of the cam type damper in secondary bevel gear systems.

THIRD PERIOD TECHNICAL TRAINING
MOTORCYCLE MECHANIC TRADE
COURSE OUTLINE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE:..... FOUR STROKE VALVE TRAIN DIAGNOSIS AND SERVICE ..... 60 HOURS

A. Valve Train Diagnosis, Service and Repair ..... 60 Hours

Outcome: ***Perform four stroke engine top end diagnostics, repair and adjustments.***

1. Perform compression and leak down tests.
2. Perform an oil pressure test.
3. Describe dynamometer theory.
4. Perform dynamometer preparation, testing and diagnosis.
5. Describe camshaft features, measurement, and inspection.
6. Measure a camshaft and related components to determine serviceability.
7. Describe the effect of camshaft design, valve seat angles and port shape on performance.
8. Perform cam chain and belt drive system inspections and adjustments.
9. Perform camshaft removal and replacement procedures.
10. Describe new camshaft set-up and break-in procedures.

SECTION TWO:..... FOUR STROKE TOP END RECONDITIONING ..... 60 HOURS

A. Head Disassembly and Reconditioning ..... 30 Hours

Outcome: ***Perform engine top end disassembly, inspection and reconditioning.***

1. Perform removal, inspection and storage of components.
2. Perform engine top end component disassembly, cleaning, inspection, fastener repair, measurement and storage.
3. Describe cylinder head reconditioning procedures.
4. Perform valve and guide cleaning, check for cracks and measure stem to guide clearance.
5. Perform cleaning carbon from the valve seats and ports.
6. Perform valve spring testing.
7. Adjust hydraulic valve lash.
8. Perform valve guide reconditioning.
9. Perform valve seat cutting.
10. Perform valve reconditioning and seating.
11. Perform cylinder head reassembly.

B. Engine Gear Case and Camshaft Service ..... 6 Hours

Outcome: ***Perform gear case inspections and camshaft fitment.***

1. Describe tappets inspection, service and repair procedures.

2. Perform inspection, measurement and adjustment of camshaft end play and backlash.
3. Perform camshaft bearing and bushing replacement.
4. Perform reassembly and adjustment of the gear case.

C. Cylinder, Piston and Connecting Rod Service ..... 9 Hours

Outcome: Inspect and recondition cylinders, pistons and connecting rod assemblies.

1. Describe checking for connecting rod trueness.
2. Describe repairing coated cylinder bores.
3. Hone a cylinder.
4. Describe cylinder boring.
5. Describe cylinder sleeve installation.
6. Perform piston ring installation and piston assembly installation.

D. Integrated Cylinder Service ..... 3 Hours

Outcome: Remove and repair an integrated cylinder and crankcase assembly.

1. Describe inspection, honing and service for integrated cylinder and crankcase assemblies.
2. Describe connecting rod and piston service in an integrated cylinder and crankcase assembly.

E. Top End Assembly and Engine Installation ..... 6 Hours

Outcome: Perform final assembly and install engine.

1. Perform cylinder head assembly and related parts installation.
2. Perform engine installation into the chassis.

F. Start Up and Break-In Procedures ..... 6 Hours

Outcome: Perform start up, break-in procedure.

1. Perform pre-start checks and initial start-up procedures.
2. Perform engine warm-up engine for initial break-in.
3. Perform running the engine on a dynamometer.
4. Describe break-in procedures, re-adjustment requirements and customer communications.

SECTION THREE: .....IGNITION AND SAFETY INTERLOCK SYSTEMS..... 60 HOURS

A. Ignition Diagnosis and Service ..... 30 Hours

Outcome: Inspect, diagnose, service and repair ignition systems.

1. Describe ignition system components, construction, functions, features, operation and testing.
2. Use ignition wiring schematics to describe current flow and voltages.
3. Verify engine timing mark alignment for a single cylinder engine.
4. Demonstrate the use of manufacturers' ignition system wiring diagrams in diagnostics.
5. Perform tests of ignition systems.
6. Demonstrate the use of an inductive tachometer to verify rpm.
7. Demonstrate the testing of ignition modules and systems.

8. Describe the operation of engine rpm limiters.
9. Describe the symptoms of a no spark or weak spark problem.
10. Demonstrate testing to determine the cause of a no spark condition.
11. Describe the symptoms of an intermittent spark under load condition problem.
12. Demonstrate testing for an intermittent spark under load problem.
13. Describe the symptoms of an engine rpm cut-off circuit malfunction.
14. Diagnose an engine rpm cut-off circuit malfunction.
15. Demonstrate verifying ignition cut-off circuit operation using special equipment.

B. Engine Management Control Systems ..... 18 Hours

Outcome: Inspect and diagnose engine management systems.

1. Describe the components, operation and feedback features of engine management systems.
2. Perform related sensor tests.
3. Demonstrate the use of on-board diagnostic systems.
4. Use fault codes to guide diagnostic procedures and repairs.

C. Kill and interlock Systems ..... 6 Hours

Outcome: Troubleshoot ignition interlock shutoff systems.

1. Demonstrate the test procedures for side-stand ignition cut-off circuit and ignition kill switch circuit.
2. Describe the system overlapping of the starter motor clutch switch and neutral switch to the ignition system.
3. Describe the system overlapping of an ATV that uses parking brake switch, neutral parking switch and an ignition starter control relay.
4. Describe a security system interlock operation.

D. New Electronic Technology ..... 6 Hours

Outcome: Describe new electronic systems found on motorcycles and ATVs.

1. Describe features and operation of on-board systems.
2. Describe features and operation of new electronic systems introduced on motorcycles or ATVs.

FOURTH PERIOD TECHNICAL TRAINING
MOTORCYCLE MECHANIC TRADE
COURSE OUTLINE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE:.....FUEL, EXHAUST AND EMISSION CONTROLS..... 60 HOURS

A. Induction and Fuel Delivery.....7 Hours

Outcome: ***Test and repair fuel and air delivery systems.***

1. Demonstrate component identification and inspection of a pressurized air box system.
2. Perform a pressure test and service to the fuel system.
3. Describe the operation of an in tank fuel level gauges and sensors.
4. Perform electrical testing for all fuel pump circuit components.
5. Inspect intake air system air control valves, damper mechanisms and vacuum switches.

B. Advanced Carburetion .....5 Hours

Outcome: ***Identify mechanical compensating circuits, electrical feedback sensors.***

1. Describe flat slide carburetor circuits and the operation of throttle position sensors.
2. Describe a multiple carburetors synchronization procedure.
3. Describe hot start and other compensating systems.

C. Fuel Injection.....26 Hours

Outcome: ***Diagnose and repair electronic fuel injection systems.***

1. Describe the concepts, components and operation of fuel injection systems.
2. Describe the inspection, test procedures and replacement of sensors and modules.
3. Retrieve and identify malfunction codes to aid diagnostic procedures.
4. Perform throttle valve synchronization, throttle cable and fast idle cable adjustments.
5. Perform fuel injector servicing
6. Perform a rear wheel dynamometer tests to test programmed fuel injection system.
7. Perform an inspection of fuel system components.
8. Perform initial base data recording and diagnostic tests using scan tool.

D. Exhaust and Emission Controls.....16 Hours

Outcome: ***Test exhaust and emission control systems.***

1. Describe the construction, operation, service and maintenance of exhaust systems.
2. Describe the operation of oxygen sensors.
3. Describe exhaust system noise levels and testing.
4. Describe combustion emissions and the effect of engine wear or modifications.
5. Describe crankcase breather, exhaust port fresh air injection and air shot systems.

6. Describe the exhaust gas analyzer operation.
7. Perform exhaust gas analyzer diagnosis procedures and maintenance.

E. Emergent Technology and Trends ..... 6 Hours

Outcome: Diagnose and service emergent technology in motorcycles.

1. Describe emergent technology available on new motorcycles.
2. Demonstrate emergent service procedures or equipment.
3. Describe trends in the motorcycle industry.

SECTION TWO: ..... TROUBLESHOOTING SYSTEMS ..... 30 HOURS

A. Diagnostic Techniques ..... 4 Hours

Outcome: Diagnose malfunctions using a systematic procedure.

1. Describe the steps in a systematic troubleshooting.
2. Identify symptoms of a problem and overlapping systems.
3. Describe the testing procedures and record keeping for continuous and intermittent problems.
4. Describe the verification procedure used after repairs are completed.

B. Diagnosis of Electrical Problems ..... 12 Hours

Outcome: Diagnose electrical problems using a systematic procedure.

1. Perform the test procedures and record the data for charging, starting and lighting systems.
2. Describe the test equipment and procedures to diagnose wiring harness related problems.
3. Perform EFI diagnosis procedures to repair a problem.

C. Diagnosis of Chassis, Suspension and Brake Problems ..... 4 Hours

Outcome: Diagnose chassis, suspension and brake problems using a systematic procedure.

1. Describe the symptoms and the test procedures for chassis and engine misalignment.
2. Describe the test procedures to solve a high speed weave problem.
3. Describe the test procedures to solve braking problems.
4. Perform the test procedures to solve a front fork bottoming problem.

D. Diagnosis of Driveline Problems ..... 4 Hours

Outcome: Diagnose driveline problems using a systematic procedure.

1. Describe the symptoms and testing to diagnose a transmission jumping out of gear.
2. Describe the symptoms and testing to diagnose an engine knocking under load.
3. Perform the testing and data recording for a noisy primary drive problem.
4. Perform the testing and data recording for poor acceleration for an ATV with a CVT transmission.
5. Perform the testing and date recording for a noisy shaft driven final drive.

E. Instrumentation, Warning Lights and Diagnostic Systems ..... 6 Hours

Outcome: Interpret problems using on board diagnostics, indicators and displays.

1. Describe the operation, diagnosis and repair of instrumentation.
2. Identify problems with warning lights and on-board diagnostic systems
3. Identify liquid crystal displays (LCD) and diagnostics with proper sequencing of data.

SECTION THREE: ..... LOWER END SERVICE ..... 60 HOURS

A. Engine Diagnostics ..... 3 Hours

Outcome: Perform engine diagnostics

1. Demonstrate dynamometer diagnosis for engine, clutch and transmission problems.
2. Perform an oil pressure test for crankshaft bearing or connecting rod wear problems.
3. Perform an engine sounds test.

B. Built Up Crankshaft Overhaul ..... 9 Hours

Outcome: Overhaul of a single cylinder engine bottom end.

1. Describe measuring crankshaft and transmission shaft end plays, bearing clearance.
2. Describe measuring connecting rod clearances and trueness.
3. Demonstrate the crankcase splitting.
4. Perform the connecting rod replacement for single cylinder crankshafts.
5. Describe crankcase and crankshaft seal or bearing replacement.
6. Demonstrate crankshaft installation

C. V-twin Engine Bottom End Overhaul ..... 12 Hours

Outcome: Recondition V twin engines bottom end.

1. Describe disassembly, inspection, cleaning, measurement and storage of components.
2. Describe camshaft and gear case disassembly and reassembly.
3. Demonstrate crankshaft end float and pinion shaft run-out measurement procedures.
4. Describe 3 piece crankshaft disassembly, reassembly and alignment.
5. Describe main bearing and seal selection and replacement procedures.
6. Describe the procedure for installing the crankshaft and balancer.

D. Multi-Cylinder Bottom End Overhaul ..... 12 Hours

Outcome: Recondition multi-cylinder engine bottom end.

1. Perform crankshaft and connecting rod bearing measurement, selection and alignment procedures.
2. Describe the inspection of engine balancer clearances and timing.
3. Describe the theory of obtaining a crankshaft static balance factor.
4. Describe the operation of crankshaft balancer systems.

E. Transmission and Manual Shift Mechanisms ..... 24 Hours

Outcome: Perform transmission inspection and overhaul.

1. Identify the components, operation, inspection and service of transmission shift mechanisms.
2. Perform inspection and adjustment of shift mechanisms.
3. Identify the parts of multi-speed transmissions.
4. Describe transmission ratios and power flow in each ratio.
5. Describe the inspection, measurement for transmission gears and shafts.
6. Perform the disassembly, inspection and reassembly of transmissions.
7. Identify transmission wear and causes.
8. Describe transmission neutral locating systems and verification.
9. Perform transmission shim installation for gear engagement.
10. Identify transmission seals, replacement procedures and leak inspections.

SECTION FOUR: ..... INSPECTIONS AND CERTIFICATION ..... 30 HOURS

A. Accessory Systems ..... 6 Hours

Outcome: Troubleshoots vehicle speed control systems.

1. Identify cruise control components and adjustments.
2. Describe the operation of electric and vacuum cruise control systems.
3. Perform cruise control diagnostic tests.
4. Perform cruise control cable lubrication and adjustments
5. Describe installation and operation of a sidecar.
6. Identify legalities related to accessories such as trailer hitches and sidecars.

B. Collision Damage Estimates ..... 8 Hours

Outcome: Perform an inspection and damage estimate of a collision damaged unit.

1. Describe the collision damage inspection.
2. Write up an estimate of repairs for a collision damaged motorcycle.
3. Describe verifying front fork tube trueness on the motorcycle.
4. Describe verifying rear swing arm tolerances and motor mount condition.
5. Perform verification of frame alignment and wheel offset.
6. Describe road test safety considerations and riding manoeuvres before and after repairs.

C. Vehicle Inspections ..... 4 Hours

Outcome: Perform Out-of-Province and Salvage Inspections.

1. Describe regulations and procedures for out-of-province and salvage Inspection.
2. Perform an out-of-province or salvage inspection.

D. Advisory Network ..... 2 Hours

Outcome: ***Describe the role of the Alberta Apprenticeship and Industry Training Board and the industry network committee.***

1. Explain the role and purpose of the advisory network.

E. Workplace Coaching Skills ..... 4 Hours

Outcome: ***Use coaching skills to train apprentices.***

1. Describe and demonstrate workplace coaching skills used for training apprentices.

F. Interprovincial Red Seal Standards Program ..... 6 Hours

Outcome: ***Discuss Red Seal / Interprovincial standards.***

1. Identify Red Seal products used to develop interprovincial examinations.
2. Use Red Seal products to prepare for an interprovincial examination.

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